

Factors in bread choice

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Abstract

The paper analyses the importance that a sample of Italian consumers attach to stated determinants of bread choice, aiming at pointing out some of the factors that can drive bread purchases. Firstly, we carried out exploratory interviews with experts and bread chain stakeholders in Italy; secondly, we administered a web survey. We processed data via principal component analysis and used the identified components for segmenting the sample. "Ethics", "sensory quality", "health", and "price" are the resultant principal component, with "sensory quality" holding consumers' preferred variables. "Origin" and "sustainability" concerns drive ethic consumers, but bread production chain seems to be marginal. Despite being a relatively simple product, bread choice has a strong cultural component, with beliefs and habits playing key roles.

Keywords

food choice motives, consumer segmentation, web survey, PCA, Italy

Introduction

Human behaviour towards food choice is multifaceted, involving actions as well as physiological and psychosocial processes (see, e.g., Sobal et al., 2014). Beside intrinsic and extrinsic product's characteristics, social context as well as consumers' attitudes, beliefs and opinions affect food choice and purchase (Biloukha and Utermohlen, 2000; Barrios and Costell, 2004). Intrinsic features include appearance, colour, shape, and presentation of the product, while the extrinsic ones include price, geographic origin, and additional (labelled) information, such as nutritional facts, production chain, and environmental sustainability. In addition, consumers draw on product's experience attributes, e.g. convenience, freshness and sensory characteristics perceived while eating, and credence attributes, i.e. abstract features such as, e.g., healthiness and naturalness (Issanchou, 1996).

Moving to bread, sensory attributes are major determinants¹ of consumers' acceptability (Heiniö, 2006; Heenan et al., 2009; Jensen et al., 2011) and ingredients, processing, social context and demographic features contribute to the purchase decision (see, e.g., Shogren et

¹ We use "determinant" and "motive" as synonyms for "factor".

al, 2003; Kihberg et al., 2004; Hersleth et al., 2005; Heenan et al., 2008). Traditional bread's ingredients are cereal flour, water, bakers' yeast or sourdough, and salt – with no added fats. Optional ingredients are added for technological (e.g. powdered gluten) and/or nutritional (e.g. omega 3 fatty acids) purposes (Jackel, 1994; Sluimer, 2005). Mainly, Italian bakers rely on soft wheat (*Triticum aestivum*) flour, while northern and eastern Europeans widely use rye (*Secale cereale*) flour. Bread is a staple food nearly worldwide, e.g. the Europeans purchase over 50 kg bread/year per capita (AIBI, 2015). In Italy – where artisan white bread has long since been the national standard – the bread market has evolved towards special flours, e.g. organic, wholegrain, multi-grain, and ancient grain, EU quality labelling and chain traceability information (PDO, PGI, guaranteed production chain, farm-to-fork), in-store baking (e.g. within supermarkets), nutritional added value through processing (e.g. stone milling, sourdough leavening), and soft pre-packaged bakery goods (e.g. soft-long-shelf-life loaves) (Guarda et al., 2004; Piergiovanni, 2013; AIBI, 2015).

Against this background, this study attempts both at pointing out some of the factors that can drive bread purchases in a sample of Italian consumers and at segmenting those consumers. In our researchers' view, Italian consumers' behaviour towards bread is interesting for at least four reasons: (i) bread is a component of local food systems, with site-specific consumption and production patterns; (ii) wheat is a commodity; (iii) information about wheat cropping location loses relevance as the product moves downstream along the supply chain; (iv) personal values are involved in bread choice (see for example, Lusk and Briggeman, 2009). We implemented a self-administered web survey to investigate the factors of bread choice that we derived from a series of interviews with bread chain experts and stakeholders. The questionnaire included items related to convenience, affordability, sensory and nutritional quality, health, origin, processing, farmer's profit, and reliability. We derived part of the empirical data from an EU-funded research, dealing with the comparison of local and global food supply chains over their relative sustainability.

The next section details our steps towards survey administration and the data analysis procedure; then, we display and discuss principal component analysis results and sample segmentation. We conclude by summarising our findings, highlighting study limitations, as well as proposing policy implications and suggesting further work.

Methodology

Gellynk and Colleagues (2009) inspired our research plan, as well as the theoretical and empirical approach. Firstly, we explain how we identify the relative importance of stated bread choice motives; then, we segment sampled consumers based on their preferred factors.

We carried out preliminary interviews with the aim of identifying the relevant dimensions for bread choice. The interviewee were two university researchers from the fields of crop genetics and food technology, respectively, both of which had collaborated with the baking industry, and two food quality managers, working for a major supermarket chain and a large scale artisan bakery. Based on these expert interviews, we highlighted three bread supply

chains in Italy, towards which addressing further interviews. The three chains differ for scale, type of processing facilities, type of baking, product distribution on the market, and retail price. Selection's aim was having three ideal types of breads that are emerging on the market. Major features of the three chains are as follows:

Pre-packaged, pre-sliced soft bread with extended shelf life: ideal type for industrial bread. The consumer has no direct access to information on wheat type and origin, but can read nutritional and sustainability labels. The product is available from supermarket shelves.

Protected Denomination of Origin "Sourdough Tuscan Bread", baked with heritage wheats cropped in Tuscany: ideal type for PDO bread. The product is baked every day and sold fresh either loose at bakeries or pre-packaged at the supermarket. The consumer has direct access to information about wheat varieties, cropping area, milling type, and leavening type.

Handcraft bread produced with ancient wheats both cropped and processed on farm: ideal type for farm-to-fork bread. Baking is on demand, up to three times per week; the product is sold loose at farm's physical and on-line stores, as well as at farmers' market and at some retailers' shops, up to three days after baking. The consumer can access information about wheat types, cropping area, milling type, leavening type, and type of oven.

All interviews were semi-structured and covered bread chain structure, wheat variety selection, cropping system, sensory and nutritional impact of milling and baking systems on the final product, packaging selection and marketing strategy, waste disposal and pricing. Drawing on Steptoe et al. (1995), we clustered those items into seven possible factors of bread choice (Table 1).

Similarly to other Authors (e.g. Pieniak et al., 2009), we designed a web survey, meant to be anonymized and self-administered. The questionnaire has four sections. Section I records socio-demographic characteristics, with closed-end "one choice" questions (e.g., age, gender, city of residence, job, number of family members). Section II covers eating and purchasing patterns by means of closed-end "one choice" questions about preferred occasions of consumption (breakfast, snack, lunch, dinner), frequency of purchase (never, rarely, often, every day), and number of portions per day (less than 1, 1-2, 3-4, more than 4). In Section III and IV, respondents rank the seventeen items on 10-point numerical scales and provide comments, respectively.

On-line questionnaire circulation was committed to undergraduate students from the University of Pisa (Tuscany, Italy). Similarly to other studies (e.g., Gellynk et al., 2009; Pohjanheimo et al., 2010), this snowball sampling ended with 206 valid questionnaires. The results of this consumer study would not allow a generalization to the overall Italian population, missing a probability sampling. Like other Authors, (e.g. Wang et al., 2015), we applied principal component analysis (PCA) with varimax rotation to reduce the factors (here, the components) to the most relevant for the sample under study; the cut-off was 0.4 factor loading. Based on PCA output, we segmented the sample, by allocating respondents among the highlighted factors based on eigenvalues exceeding 1.

Table 1. Factors of bread choice and questionnaire items (Steptoe et al., 1995).

Factor	Item	Variable
Weight control	Fat free	Fat
Sensory appeal	Taste	Flavour
	Freshness	Freshness
Familiarity	Handcraft production	Craft
	Type of baking oven	Oven
	Loaf shape	Shape
	Good impression on guests	Image
Convenience	Shelf-life	Shelf life
Price	Price	Price
Health	Type of leavening	Leavening
	Flour: wheat, grains other than wheat, multi-grain	Cereal
	Flour: degree of coarseness, from white to wholemeal	Flour
	Supplementation, or not, with wheat germ or omega 3 fatty acids	Omega3
Ethics	Environmental sustainability of the production process	Sustainability
	Origin of flour or bread	Origin
	Producer trust	Trust
	Fair farmer profit	Fair labour

Source: own elaboration, based on Steptoe et al. (1995)

Results

Table 2 shows the average, the standard deviation, as well as minimum and maximum values per variable.

Respondents expressed their preferences by evaluating each variable on an integer 1-10 scale: the higher the score, the higher the influence of the variable on consumer choice. Showing the highest means among the investigated variables, flavour, freshness, shelf life and flour are sample's preferred variables, while fat, omega3, shape and fair labour are the least preferred. Origin, leavening and trust show the highest standard deviation, due to answer heterogeneity.

We used PCA outputs to segment the sample based on individual consumer determinants of bread purchase. The PCA returned four components, i.e. group of factors with eigenvalues over 1. The components reduce consumer profiles' heterogeneity by clustering the sample into four main categories. We coded each category to one of the four factors that sums up the meaning of variables with high factor loadings (≥ 0.4). The four factors are ethics (including environmental sustainability and origin related concerns), sensory quality (including flavour, freshness, and shape), health (including concerns about wheat and flour nutritional quality), and price (selling price at retailer's). The variance explained by those four components is satisfactory (0.73), but unsatisfactory for all other variables, with just

shape and image being poorly explained. Kaiser-Meyer-Olkin sampling adequacy is very good (0.91).

Table 2. Descriptive statistics.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Fat	206	3.81	2.70	1	10
Flavour	206	7.69	2.77	1	10
Freshness	206	7.91	2.78	1	10
Craft	206	5.62	2.92	1	10
Oven	206	6.19	2.76	1	10
Shape	206	4.04	2.75	1	10
Image	206	5.07	3.14	1	10
Shelf life	206	6.40	2.93	1	10
Price	206	4.18	2.63	1	10
Leavening	206	4.88	3.02	1	10
Cereal	206	5.69	2.82	1	10
Flour	206	6.21	2.93	1	10
o3	206	3.98	2.92	1	10
Sustainability	206	4.49	2.93	1	10
Origin	206	5.16	3.04	1	10
Trust	206	5.87	2.95	1	10
Fair labour	206	4.33	2.92	1	10

Source: own elaboration

Table 3. Results of the PCA (factor loadings ≥ 0.4 in bold; rounded up values).

Variable	Ethics	Sensory quality	Health	Price	Fraction of variance unexplained
Fat	0.33	-0.21	0.18	0.23	0.33
Flavour	-0.04	0.41	0.11	0.11	0.17
Freshness	-0.08	0.44	0.14	0.04	0.13
Craft	0.24	0.21	0.06	-0.15	0.26
Oven	-0.05	0.30	0.31	-0.30	0.24
Shape	-0.08	0.36	-0.14	0.35	0.49
Image	0.17	0.33	-0.19	-0.05	0.49
Shelf life	0.14	0.30	-0.07	0.19	0.31
Price	0.01	0.03	0.04	0.75	0.23
Leavening	0.17	-0.01	0.35	-0.17	0.31
Cereal	0.00	-0.02	0.53	0.04	0.18
Flour	-0.09	0.06	0.54	0.08	0.17
o3	0.31	-0.20	0.24	0.19	0.25
Sustainability	0.43	0.03	-0.04	-0.09	0.22
Origin	0.40	0.09	-0.07	-0.06	0.22
Trust	0.25	0.27	-0.04	-0.13	0.25
Fair labour	0.48	-0.06	-0.08	0.06	0.19
Sample share	22%	29%	15%	34%	

Source: own elaboration

The factor “ethics”, entailing environmental sustainability of bread production chain and bread origin, falls within the broader category of ethical consumption patterns, with consumers being concerned with personal beliefs while selecting their foods. Moving to “sensory quality”, flavour, freshness, and shape show the highest factor loadings, with organoleptic issues driving the choices of consumers within this segment. The factor “health” clusters consumers concerned about bread’s ingredients, their associated nutritional quality, energy density and potential negative impact on health. The recent popularity of grain diversity in baking, as well as the prevalence of gluten intolerance and celiac disease may have informed those consumers. Finally, as we expected, “price” encompasses budget food consumers, which associate importance to bread’s convenience only (factor loading = 0.75). Provided the downward trend in consumer food expenditure in Italy, this latter result confirms the shift of consumer preferences towards cheaper foodstuffs.

Based on PCA results, we have predicted the distribution of sampled consumers within the four components. Price concerned consumers account for the largest share, with one third of the respondents using money saving as the main bread choice criterion. Ethics and sensory quality cluster 22% and 29% consumers, respectively, while health and nutritional concerns can drive bread purchases of just 15% consumers.

Cultural values that Italian consumers attach to bread may help explain our study’s results, as most consumers perceive bread as a basic and traditional product, with soft pre-packaged items being not considered a perfect substitute for traditional loaves with “crust”. The great majority of Italians buy their daily bread from local artisan bakeries. Smell, crust/crumb ratio, and crust crispiness are major determinants of bread purchases, with freshness being an underlying requirement (see, e.g., Galli et al., 2015). Freshness is a major determinant of bread liking also in other European and non-European countries (see, for example the studies of Heenan et al., 2008, 2009). Italian baking draws on artisan knowhow, with a high variety of locally embedded processing systems. Thus, consumers appreciate bread origin, as they associate it to intrinsic quality. The marketing study of Ahmed et al. (2004) led to similar finding while assessing the importance of country of origin for low involvement products in Asia. However, bread origin lost some importance when the price for foods from preferred origins significantly exceeded that of the substitutes. This behaviour towards price is somewhat shared by our sample. US consumers studied by Lusk and Briggeman (2009) revealed a similar attitude.

Conclusions

This paper analyses some of the underlying factors in bread choice in a sample of Italian consumers. Bread is a staple food nation-wide, which consumers buy drawing on their own beliefs and attitudes towards economic, social, and environmental issues.

We found that individual concerns about ethics, sensory quality, health, and price are factors in bread choice and contribute to the segmentation of sampled consumers in four related categories. Our study is in line with previous literature, highlighting that available information, as well as personal values, attitudes and habits help explain decisions about bread choice.

Even though exogenous determinants have a role, consumer profiles affect bread purchases. According to marketing research, consumers rely more on extrinsic cues in evaluating low-involvement products (i.e. bread) (Zeithaml, 1988). Here, the variable “origin” contributes with the variable environmental “sustainability” to characterize the segment of consumers with ethical concerns (values). Bread selection criteria that rely on bread production chain seem to be marginal within the sample. Despite being a relatively simple product, bread choice has a strong cultural component, with beliefs and habits playing key roles.

Further research will involve investigating the extent to which socio-economic variables (factors) explain consumer choices. Particularly, it would be worth applying econometrical techniques, such as multinomial logit modelling, to explain the determinants of consumer discrete choices. The paper has several limitations, with data gathering being the major shortcoming. The snowball procedure intrinsically lead to sample “auto-selection”. In addition, non-probability samplings are subject to researcher bias. In this study, the snowball started from university students, a defined segment of consumers, who would have directed the sampling towards their pairs. Such a researcher bias may exclude relevant segments of consumers: here, e.g., consumers with limited access to the Internet. As a result, our findings may overestimate consumers’ motivational concerns associated to bread selection and purchase. Better data quality would benefit PCA and result interpretation.

References

- AIBI (2015). Bread Market Report 2013. AIBI, Association Internationale des Boulangeries Industrielles: Bruxelles, Belgium. Available from: <http://www.aibi.eu/wp-content/uploads/draft-AIBI-Bread-Market-report-2013.pdf>
- Ahmed, Z. U., Johnson, J. P., Yang, X., Kheng Fatt, C., Sack Teng, H., & Chee Boon, L. (2004). Does country of origin matter for low-involvement products?. *International Marketing Review*, 21(1), 102-120.
- Barrios, E. X., Costell, E. (2004). Review: use of methods of research into consumers’ opinions and attitudes in food research. *Food Science and Technology International* 10(6): 359-371.
- Biloukha, O.O., Utermohlen, V. (2000). Correlates of food consumption and perceptions of foods in an educated urban population in Ukraine. *Food Quality and Preference* 11: 475-485.
- Furst, T., Connors, M., Bisogni, C. A., Sobal, J., Falk, L. W. (1996). Food choice: a conceptual model of the process. *Appetite* 26(3): 247-266.
- Gellynck, X., Kühne, B., Van Bockstaele, F., Van de Walle, D., Dewettinck, K. (2009). Consumer perception of bread quality. *Appetite* 53(1): 16-23.
- Guarda, G., Padovan, S., Delogu, G., 2004. Grain yield, nitrogen-use efficiency and baking quality of old and modern Italian bread-wheat cultivars grown at different nitrogen levels. *European Journal of Agronomy* 21: 181-192.
- Heenan, S. P., Dufour, J. P., Hamid, N., Harvey, W., Delahunty, C. M. (2008). The sensory quality of fresh bread: Descriptive attributes and consumer perceptions. *Food research international* 41(10): 989-997.

- Heenan, S. P., Hamid, N., Dufour, J.-P., Harvey, W., Delahunty, C. M. (2009). Consumer freshness perceptions of breads, biscuits and cakes. *Food Quality and Preference* 20(5): 380–390.
- Heiniö, R.-L. (2006). Sensory attributes of bakery products. In Y. H. Hui (ed.), *Bakery products: science and technology*. Ames: Blackwell Publishing.
- Hersleth, M., Berggren, R., Westad, F., Martens, M. (2005). Perception of bread: A comparison of consumers and trained assessors. *Journal of Food Science* 70(2): S95–S101.
- Hills, K.M., Goldberger, J.R. and Jones, S.S. (2013). Commercial bakers and the relocation of wheat in western Washington State. *Agriculture and Human Values* 30.3: 365–378.
- Issanchou, S. (1996). Consumer expectations and perceptions of meat and meat product quality. *Meat Science* 43: S5–S19.
- Jackel, S.S. (1994). New value-added opportunities. *Cereal Foods World* 39: 188–189.
- Jensen, S., Oestdal, H., Skibsted, L. H., Larsen, E., Thybo, A. K. (2011). Chemical changes in wheat pan bread during storage and how it affects the sensory perception of aroma, flavor, and taste. *Journal of Cereal Science* 53(2): 259–268.
- Kihberg, I., Johansson, L., Kohler, A., Risvik, E. (2004). Sensory qualities of whole wheat pan bread-influence of farming system, milling and baking technique. *Cereal Science* 39(1): 67–84.
- Lusk, J. L., & Briggeman, B. C. (2009). Food values. *American Journal of Agricultural Economics*, 91(1), 184–196.
- Östlund, U., Kidd, L., Wengström, Y., Rowa-Dewar, N. (2011). Combining qualitative and quantitative research within mixed method research designs: a methodological review. *International journal of nursing studies* 48(3): 369–383.
- Pagani, M. A., Lucisano, M., Mariotti, M. (2008). Italian Bakery. In Hui, Y. H., Corke, H., De Leyn, I., Nip, W. K., Cross, N. A. (eds.) (2008). *Bakery products: science and technology*. John Wiley & Sons.
- Pieniak, Z., Verbeke, W., Vanhonacker, F., Guerrero, L., & Hersleth, M. (2009). Association between traditional food consumption and motives for food choice in six European countries. *Appetite* 53(1): 101–108.
- Piergiovanni, A.R., 2013. Evaluation of genetic variation and grain quality of old bread wheat varieties introduced in north-western Italian environments. *Genetic Resources and Crop Evolution* 60: 325–333.
- Pohjanheimo, T., Paasovaara, R., Luomala, H., & Sandell, M. (2010). Food choice motives and bread liking of consumers embracing hedonistic and traditional values. *Appetite* 54(1): 170–180.
- Shogren, R. L., Mohamed, A. A., Carriere, C. J. (2003). Sensory analysis of whole wheat/soy flour breads. *Journal of Food Science* 68(6): 2141–2145.
- Sluimer, P. (2005). *Principles of Breadmaking: Functionality of Raw Materials and Process Steps*. St. Paul, USA: American Association of Cereal Chemists.
- Sobal, J., Bisogni, C. A., Jastran, M. (2014). Food Choice Is Multifaceted, Contextual, Dynamic, Multilevel, Integrated, and Diverse. *Mind, Brain, and Education* 8(1): 6–12.
- Starr, M. A. (2014). Qualitative and Mixed-Methods Research in Economics: Surprising Growth, Promising Future. *Journal of Economic Surveys* 28(2): 238–264.

- Steptoe, A., Pollard, T. M., Wardle, J. (1995). Development of a measure of the motives underlying the selection of food. The food choice questionnaire. *Appetite* 25(3): 267–284.
- Venkatesh, V., Brown, S. A., Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *Mis Quarterly* 37(1): 21-54.
- Wang, O., De Steur, H., Gellynck, X., Verbeke, W. (2015). Motives for consumer choice of traditional food and European food in mainland China. *Appetite* 87: 143-151.
- Zeithaml, V.A. (1988). Consumer perceptions of price, quality and value: a means-end model and synthesis of evidence. *Journal of Marketing* 52(3): 2-22.